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PATENT

In the pending application, independent claims 3, 27, 36, 37, and 39 each recite a coreless printed circuit board transformer that is adapted to be operated only at a frequency that is less than the transformer's resonant frequency.

In addition, claims 3 and 37 recite an operating frequency between 300 kHz and 20 MHz. Claim 27 similarly recites an operating frequency of from 100 kHz to at least 20 MHz.

Applicants respectfully submit that neither of these features is obvious from the cited references.

The rejection characterizes JP 54-110424 as disclosing a general structure similar to that of the claimed invention. Applicants do not concede the correctness of the characterization. The rejection concedes that JP 54-110424 does not disclose operating frequencies or relationships between operating and resonant frequencies as recited in the pending claims. Applicants agree.

The rejection relies upon Machiels to disclose a transformer with a resonant frequency on within the range of a few MHz to a few hundred MHz, and asserts that this constitutes disclosure of both the operating frequencies of the present invention and the relationships between operating and resonant frequencies recited in the pending claims. Applicants respectfully disagree.

First, with regard to the actual operating frequencies, the range attributed to Machiels differs significantly from the ranges recited in those claims 3, 27, and 37. The operating frequency disclosed at page 10, line 32 of Machiels has a minimum of "a few MHz". Machiels does not disclose or suggest ranges that extend as low as 300 kHz as in claims 3 and 37 of the present invention, or as low as 100 kHz as in claim 27.

Second, Applicants respectfully submit that Machiels does not disclose the relationship between the specific operating frequencies of a transformer device and the relationship of those frequencies with the resonant frequencies of the transformer device.

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As noted above, claims 3, 27, 36, 37, and 39 of the present invention each recite a coreless printed circuit board transformer that is adapted to be operated only at a frequency that is less than the transformer's resonant frequency.

In contrast, Machiels is directed towards a circuit that is to be operated at resonant frequencies. Indeed, one of the principle aims of Machiels appears to be providing a circuit that has a broad range of resonant frequencies, so that it may be used efficiently in that broad range for applications that require or benefit from operation at a resonant frequency, i.e. resonator circuits.

Applicants note that Machiels broadly and repeatedly refers to the device thereof as a "resonator", i.e. it operates at resonant frequencies. More particularly, Applicants reference for example page 8, lines 1-6 of Machiels. Therein Machiels discloses that the "tuned circuit has a series of resonant frequencies", and attributes advantages to this arrangement, i.e. it "can be adapted to a broad range of impedance". That is, as noted above, the device of Machiels is designed to operate in a range of resonant frequencies.

Thus, the relationships between operating frequencies and resonant frequencies are entirely different for Machiels and the present invention. Machiels teaches operation at resonant frequencies, while the pending claims recite operation only at a frequency that is less than the transformer's resonant frequency. Machiels nowhere discloses or suggests operating a transformer only at a frequency that is less than the transformer's resonant frequency.

Thus, regardless of what frequencies Machiels does or does not disclose, Machiels actually teaches away from the present invention.

Applicants respectfully submit that it would not be obvious to use resonant frequencies from a device designed for use at resonant frequencies as the operating frequencies for a device designed to be used only below its resonant frequency. Merely disclosing a particular range of

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frequencies does not constitute either disclosure or suggestion of a specific functional relationship, or any advantages thereof.

For at least these reasons, Applicants respectfully submit that Machiels does not remedy the aforementioned deficiencies of JP 54-110424 with regard to operating frequencies and relationships between operating and resonant frequencies.

Furthermore, Applicants respectfully question whether a person of ordinary skill in the art would be motivated to combine Machiels with JP 54-110424 to arrive at the present invention, even if it were possible to do so, which point Applicants do not concede.

As noted above, Machiels is directed towards a device to be operated at resonant frequencies, whereas the present invention is a transformer operated only below resonant frequencies.

In addition, Applicants note that one of the advantages that follows from the structure and operation of the present invention is the ability to minimize power requirements and/or maximize energy efficiency, as described for example at page 2, lines 11-13 of the specification. This is advantageous at least for applications such as signal and energy transfer, as described for example at page 2, lines 22-23 of the specification.

In contrast, Machiels expressly discloses that the device thereof is a resonator. That is, emission of radiation is its designed function, and it is constructed in such a way as to produce radiation.

It will be appreciated that radiation emitted by a transformer represents power output, and thus requires power input. Constructing a transformer specifically to produce radiation necessarily increases the power requirements, since the energy of radiation must be provided. Furthermore, the energy efficiency of the device for non-radiative signal and energy transfer is reduced, since energy is lost as radiation.

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Thus, Machiels is dedicated to generating what is for the present invention a waste product, namely radiation. Applicants respectfully question whether a person of ordinary skill in the art would rely upon a reference that teaches production of a waste product when attempting to produce a product that avoids that same waste product.

In view of the preceding remarks, Applicants respectfully submit that claims 3, 27, 36, 37, and 39 are not obvious from JP 54-110424 in view of Machiels. Reconsideration and withdrawal of the rejection is respectfully requested.

Claim 38 depends from independent claim 4. Claim 41 depends from claim 5, which in turn depends from claim 4. Claim 42 depends from claim 38, which depends from claim 4. As independent claim 4 was not rejected as obvious from JP 54-110424 in view of Machiels, Applicants respectfully submit that separate arguments need not be presented on behalf of claims 38, 41, and 42 at this time. Applicants do not concede the correctness of the rejection, and reserve the right to present further arguments against it. In addition, Applicant notes that independent claim 4 recites a coreless printed circuit board transformer adapted to be operated only at a frequency that is less than that transformer's resonant frequency. As such, the remarks presented above with regard to independent claims 3, 27, 36, 37, and 39 should apply equally to claim 4, and by extension to its dependent claims 38, 41, and 42.

Each of claims 40 and 42-46 depends from one of independent claims 36 and 39, and includes the limitations thereof. The above arguments made with regard to claims 36 and 39 apply equally to these dependent claims, and Applicants respectfully submit that separate arguments need not be presented on their behalf at this time. Applicants do not concede the correctness of the rejection, and reserve the right to present further arguments against it.

Claims 4-6 and 28-29 are rejected under 35 U.S.C. § 103(b) as being obvious from JP 54-110424 in view of Machiels, further in view of Commander et al. (U.S. Patent No. 4,748,532). Applicants respectfully traverse the rejection.

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As in the preceding rejection, each of independent claims 4, 28, and 29 recites a coreless printed circuit board transformer adapted to be operated only at a frequency that is less than that transformer's resonant frequency. Claim 29 also recites an operating frequency of from 100 kHz to at least 20 MHz.

Commander is characterized as disclosing a transformer operated by a high frequency carrier signal modulated by a low-frequency switching signal. However, even if Commander is correctly characterized, which point Applicants do not concede, Commander does not remedy the deficiencies of JP 54-110424 and Machiels as argued above.

In particular, Applicants find no disclosure or suggestion in Commander regarding the operation of a coreless PCB transformer only at frequencies lower than the resonance frequency of the transformer, or of a coreless PCB transformer operating at a frequency of from 100 kHz to at least 20 MHz.

In addition, Applicants note that Commander is directed to a core-based transformer, while JP 54-110424 discloses a coreless transformer. Core-based and coreless transformers are different types of devices, with different operating parameters. For example, core-based transformers have core losses, core saturation, and upper frequency limitation problems. Coreless transformers do not have these disadvantages. Features or properties of core-based transformers are not necessarily transferable to coreless transformers, and may not lead even indirectly to similar results with coreless PCB transformers in any obvious fashion. Applicants therefore respectfully question whether Commander is suitable for combination with JP 54-110424.

In view of the preceding remarks, Applicants respectfully submit that claims 4, 28, and 29 are not obvious from JP 54-110424 in view of Machiels and Commander. Reconsideration and withdrawal of the rejection is respectfully requested.

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Claims 5-6 depend from claim 4, and include the limitations thereof. The above arguments made with regard to claim 4 apply equally to these dependent claims, and Applicants respectfully submit that separate arguments need not be presented on their behalf at this time. Applicants do not concede the correctness of the rejection, and reserve the right to present further arguments against it.

Claims 7-8 are rejected under 35 U.S.C. § 103(b) as being obvious from JP 54-110424 in view of Machiels, further in view of Commander, further in view of Miyoshi et al. (U.S. Patent No. 3,866,086). Applicants respectfully traverse the rejection.

Independent claim 7 also recites a coreless printed circuit board transformer adapted to be operated only at a frequency that is less than that transformer's resonant frequency.

Miyoshi is characterized as disclosing a capacitance connected across a secondary winding for adjusting resonance frequency. However, even if Miyoshi is correctly characterized, and suitable for combination with JP 54-110424, Machiels, and Commander, which points Applicants do not concede, Miyoshi does not remedy the deficiencies of JP 54-110424, Machiels, and Commander as argued above.

In brief, Applicants find no disclosure or suggestion in Miyoshi regarding the operation of a coreless PCB transformer only at frequencies lower than the resonance frequency of the transformer.

In view of the preceding remarks, Applicants respectfully submit that claim 7 is not obvious from JP 54-110424 in view of Machiels, Commander, and Miyoshi. Reconsideration and withdrawal of the rejection is respectfully requested.

Claims 8 depends from claim 7, and includes the limitations thereof. The above arguments made with regard to claim 7 apply equally to claim 8, and Applicants respectfully submit that separate arguments need not be presented on its behalf at this time. Applicants do

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not concede the correctness of the rejection, and reserve the right to present further arguments against it.

As all matters raised in the Office Action have now been addressed, Applicants believe that all pending claims are in condition for immediate allowance. Applicants respectfully request favorable reconsideration of the pending claims in the form of a Notice of Allowance.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Michael L. Lamberty (Reg. No. 50,760) at (612) 336-4789, or Applicant's primary attorney-of record, Michael D. Schumann (Reg. No. 30,422), at (612) 336-4638.

Respectfully submitted,



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